

## METHOD OF SELECTIVE REGION VAPOR PHASE ALUMINIZING

### ABSTRACT

The present invention is process for forming diffusion aluminide coatings on an uncoated surface of a substrate, without interdiffusing a sufficient amount of aluminum into a coating layer to adversely affect the coating growth potential and mechanical properties of said coating layer. A metal substrate is provided comprising an external surface and an internal passage therein defined by an internal surface, at least a portion of the external surface of the substrate being coated with a coating layer selected from the group consisting of  $\beta$ -NiAl-base, MCrAlX, a line-of-sight diffusion aluminide, a non-line-of-sight diffusion aluminide, a pack diffusion aluminide, and a slurry diffusion aluminide on said substrate. The external surface of the substrate is cleaned. The metal substrate is subjected to a aluminum vapor phase deposition process performed using a fluorine-containing activator selected from the group consisting of AlF<sub>3</sub>, CrF<sub>3</sub>, NH<sub>4</sub>F, and combinations thereof, at a rate in the range of about 0.036 mols of fluorine per ft<sup>3</sup>/hr of transport gas to about 0.18 mols of fluorine per ft<sup>3</sup>/hr of transport gas, at a temperature in the range of about 1350°F (730°C) to about 1925°F (1050°C), using a transport gas selected from the group consisting of argon, nitrogen, hydrogen, and combinations thereof, the transport gas being provided at a flow rate in the range of about 20 ft<sup>3</sup>/hr to about 120 ft<sup>3</sup>/hr for a period of time in the range of about 2 hours to about 10 hours. The substrate is then cooled. The present invention is also a superalloy article coated with a diffusion aluminide layer using the diffusion aluminide coating process of the present invention.